MAINTENANCE AND USE OF PROTECTIVE STRUCTURES

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Abstract. This article explores the critical role of maintenance and operational use of protective structures in ensuring safety and functional longevity. Protective structures serve as essential barriers against various hazards, including environmental threats and physical impacts. By examining preventive and corrective maintenance strategies, this article aims to outline best practices for maximizing structural integrity and performance, ensuring readiness, and minimizing long-term risks.

Keywords: protective structures, maintenance, preventive maintenance, structural integrity, safety, hazard protection, asset resilience.

Анотація. У статті досліджується критична роль технічного обслуговування та експлуатаційного використання захисних споруд у забезпеченні безпеки та функціональної довговічності. Захисні споруди служать важливими бар'єрами проти різних небезпек, включаючи екологічні загрози та фізичні впливи. Аналізуючи стратегії профілактичного та коригувального технічного обслуговування, стаття має на меті окреслити найкращі практики для максимізації структурної цілісності та продуктивності, забезпечення готовності та мінімізації довгострокових ризиків.

Ключові слова: захисні конструкції, технічне обслуговування, профілактичне технічне обслуговування, структурна цілісність, безпека, захист від небезпек, стійкість споруди.

Introduction. The maintenance and operational use of protective structures are critical in safeguarding both personnel and essential assets. Effective maintenance ensures these structures retain their designed integrity and functionality, allowing them to perform optimally in protecting against environmental hazards, military threats, and other emergencies. This article will outline key standards and best practices for maintaining protective structures, focusing on both preventive and corrective measures. Attention to these factors not only prolongs the lifespan of the structures but also enhances overall safety, compliance, and resilience in high-stakes situations.

Analysis of the state of issue. Protective structures are essential across multiple sectors, offering resilience against external threats such as severe weather, chemical spills, and physical breaches. However, without consistent maintenance, the efficacy of these structures diminishes, potentially compromising safety and functionality. Key challenges include environmental degradation, wear and tear from regular use, and resource allocation for timely inspections. This section evaluates the current status and practices surrounding the upkeep and operational readiness of protective structures, identifying gaps and areas for improvement.

The purpose of the work: the primary objective is to assess effective maintenance techniques and usage protocols that ensure the sustained reliability of protective structures. This study seeks to analyze current methodologies, identify best practices, and propose enhanced strategies for maintaining these critical assets in both regular and emergency conditions.

Methods, materials and research results. The study employs a multi-method approach, analyzing case studies of various protective structures and reviewing existing maintenance protocols. Key materials used include inspection reports, maintenance logs, and relevant structural components subject to regular testing. The findings highlight the importance of a structured maintenance schedule, the efficacy of advanced materials, and the need for periodic training for personnel. Regular updates to the protective design based on material advancements and real-world testing results also significantly enhance performance and durability.

All civil protection (CP) protective structures must be utilized in an operational mode for the needs of industries [1] and services for the population, including:

- Sanitary facilities (locker rooms, showers, etc.);
- Cultural and recreational spaces (such as discos, libraries);
- Classrooms;
- Storage facilities, among others.

During operation, all requirements ensuring the facility's readiness to transition to a protective mode (within 12 hours) must be adhered to, including maintaining necessary conditions for human occupancy during emergencies [2]. Protective properties, both of the structure as a whole and of its individual elements, must be preserved.

To ensure this, the following is prohibited:

- Removal of CP equipment [3], remodelling, or creating openings in the enclosing structures;
- Obstructing entrances to the protective structures.

All rooms must remain dry and regularly ventilated, with hermetic doors kept open on stands and covered by removable screens. Engineering and technical equipment must remain operational and ready for use, with the exception of filters and regeneration units [2]. The water supply and sewage systems are inspected annually, with special attention to valves, gates, and emergency water storage tanks. Emergency water containers should be kept clean and filled upon converting the shelter into a protective mode. If a water intake well exists, it should be tested monthly, running for 30-40 minutes. Emergency containers for sewage should be securely closed [3].

Adapting rooms for protective use typically involves converting basements of residential buildings, storerooms, concrete or natural caves, and other durable spaces to increase their protective capabilities, seal them, and install basic ventilation [2]. Protective properties are improved by thickening walls, sealing windows, and other modifications. For example, soil embankments are added around exterior walls that extend above ground level. Doors and other entries are reinforced with dense materials, such as felt or rubber seals.

In areas with radioactive contamination, further steps must be taken to ensure airtightness and reduce exposure risks. This includes sealing any cracks in windows and doors, covering ventilation shafts, and placing insulating materials around door frames. Water and food should be stored in airtight containers, with extra water stored in sealed containers. Wet cleaning of living spaces is also advised [3].

Conclusion. In summary, the maintenance of civil defence protective structures during peacetime is crucial for their readiness in emergencies. These structures serve multiple public and operational needs while adhering to strict regulations on preservation, structural integrity, and accessibility. By regularly inspecting engineering systems, ensuring airtight conditions, and keeping emergency equipment functional, these spaces can be quickly converted to protective modes when necessary. Such careful upkeep, including limitations on modifications and routine ventilation, helps preserve the structures' protective capabilities for effective use during potential crises.

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